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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/656,343	09/05/2003	Bing Shan	KSU-101US	7807

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EXAMINER	
VAN ROY, TOD THOMAS	
ART UNIT	**PAPER NUMBER**
2828	

DATE MAILED: 08/18/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/656,343	SHAN ET AL.	
	Examiner	Art Unit	
	Tod T. Van Roy	2828	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-17* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *10/02/2003*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

Claim 11 is objected to because of the following informalities:

Claim 11 states "power amplification" at the end of line 2, and is believed to more properly read "pre-amplification", and has been examined as such.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Unternahrer (US 6108357) in view of Pang (US 2003/0193975).

With respect to claim 1, Unternahrer teaches a method of providing high peak power in a pulse laser system comprising: a pumped gain media (col.2 lines 60-63),

directing the beam through the pumped gain media to produce an intermediate beam (col.2 lines 45-50), changing the beam diameter of the intermediate beam to produce a re-collimated beam (col.6 lines 40-46), and redirecting the re-collimated beam through the pumped gain medium (col.6 lines 35-40) for at least one power amplification pass to produce a high power output beam (col.1 lines 23-28). Unternahrer does not teach the method to include a low power pulsed seed beam. Pang teaches a regenerative amplifier using ultrashort pulses wherein a low power pulsed seed beam is applied to a pumped gain medium ([0002]). It would have been obvious to one of ordinary skill in the art to combine the method of Unternahrer with the pulsed seed beam of Pang to use the ultrashort amplified pulses in various laser drilling and machining applications ([0016]).

With respect to claim 2, Unternahrer and Pang teach the method as outlined in the rejection to claim 1, and Unternahrer further teaches directing the re-collimated intermediate beam through the pumped gain medium for multiple power amplification passes (col.6 lines 35-40).

With respect to claim 3, Unternahrer and Pang teach the method as outlined in the rejection to claim 1, and Unternahrer further teaches spatially filtering the intermediate beam while increasing its effective diameter (col.6 lines 57-62).

With respect to claim 4, Unternahrer and Pang teach the method as outlined in the rejection to claim 1, and Unternahrer further teaches the number of power amplification passes is less than or equal to the number of pre-amplification passes (col.5 lines 46-53, 3 pre, 3 pwr).

With respect to claim 5, Unternahrer and Pang teach the method as outlined in the rejections to claims 1and 4, but do not teach the number of pre-amplification passes to be seven. It would have been obvious to one of ordinary skill in the art at the time of the invention to increase the number of pre-amplification passes from 3 to 7, as it has been found to be within the general skill of a worker in the art to discover an optimum working range by routine experimentation (see MPEP 2144.05 II A - In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955) – speaking of the fact that it is not inventive to discover the optimum or workable ranges by routine experimentation, i.e. the optimum number of passes through the gain medium during the pre-amplification process).

With respect to claim 6, Unternahrer and Pang teach the method as outlined in the rejection to claim 1, and Unternahrer further teaches controlling the re-collimated beam diameter to match a pumped region of the gain medium (col.6 lines 38-40, 49-51, 60-62, speaking of increasing the beam diameter to more closely match pumped gain region size).

With respect to claim 7, Unternahrer and Pang teach the method as outlined in the rejection to claim 1 above, and Pang further teaches the gain medium to be Ti:Sapphire ([0003]). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the method of Unternahrer with the gain medium of Pang as Ti:Al2O3 is a well known gain medium in regenerative amplifiers (Pang, [0003]) and provides a broad gain spectrum suitable for use with many seed lasers.

With respect to claim 8, Unternahrer teaches a single stage laser system comprising: a pumped gain medium (col.2 lines 60-63), means for accepting an input pulse (through an edge of gain medium, similar to the flash lamps), means for directing the beam through the pumped gain medium (fig.1 #26,28) for a plurality of pre-amplification passes to produce an intermediate beam (col.2 lines 45-50), means for re-collimating the intermediate beam to produce a larger effective beam diameter in the pumped gain medium to produce a re-collimated intermediate beam (col.6 lines 40-46), and means for redirecting the re-collimated intermediate beam through the pumped gain medium for at least one power amplification pass to produce a high-power output beam (fig.1 #42,44,46,48). Unternahrer does not teach the system to include a low power pulsed seed beam. Pang teaches a regenerative amplifier using ultrashort pulses wherein a low power pulsed seed beam is applied to a pumped gain medium ([0002]). It would have been obvious to one of ordinary skill in the art to combine the pulsed laser system of Unternahrer with the pulsed seed beam of Pang to use the ultrashort amplified pulses in various laser drilling and machining applications ([0016]).

With respect to claim 9, Unternahrer and Pang teach the system as outlined in the rejection to claim 8, and Unternahrer further teaches directing the re-collimated intermediate beam through the pumped gain medium for multiple power amplification passes (col.6 lines 35-40).

With respect to claim 10, Unternahrer and Pang teach the system as outlined in the rejection to claim 8, and Unternahrer further teaches spatially filtering the intermediate beam while increasing its effective diameter (col.6 lines 57-62).

With respect to claim 11, Unternahrer and Pang teach the system as outlined in the rejection to claim 8, and Unternahrer further teaches the number of power amplification passes is less than or equal to the number of pre-amplification passes (col.5 lines 46-53, 3 pre, 3 pwr).

With respect to claim 12, Unternahrer and Pang teach the system as outlined in the rejections to claims 8 and 11, but do not teach the number of pre-amplification passes to be seven. It would have been obvious to one of ordinary skill in the art at the time of the invention to increase the number of pre-amplification passes from 3 to 7, as it has been found to be within the general skill of a worker in the art to discover an optimum working range by routine experimentation (see MPEP 2144.05 II A - In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955) – speaking of the fact that it is not inventive to discover the optimum or workable ranges by routine experimentation, i.e. the optimum number of passes through the gain medium during the pre-amplification process).

With respect to claim 13, Unternahrer and Pang teach the system as outlined in the rejection to claim 1, and Unternahrer further teaches controlling the re-collimated beam diameter to match a pumped region of the gain medium (col.6 lines 38-40, 49-51, 60-62, speaking of increasing the beam diameter to more closely match pumped gain region size).

With respect to claim 14, Unternahrer and Pang teach the system as outlined in the rejection to claim 8 above, and Pang further teaches the gain medium to be Ti:Sapphire ([0003]). It would have been obvious to one of ordinary skill in the art at the

time of the invention to combine the system of Unternahrer with the gain medium of Pang as Ti:Al2O3 is a well known gain medium in regenerative amplifiers (Pang, [0003]) and provides a broad gain spectrum suitable for use with many seed lasers.

Claims 15-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Unternahrer in view of Pang, and further in view of Karasawa et al. (US 6700905).

With respect to claim 15, Unternahrer teaches a high peak power laser system comprising: a gain medium (fig.1 #24), cavity mirrors disposed upon opposite sides of the pumped gain region (fig.1 #26,28) within which multiple passes of the beam through the pumped gain region can occur, a lens system for re-collimating the intermediate beam to produce a re-collimated intermediate beam with increased effective diameter (col.6 lines 40-51), one or more mirrors for directing the re-collimated intermediate beam back into the cavity for one or more power amplification passes (fig.1 #40,42,44,46,48), and an output mirror for directing a high-power beam out of the system (fig.1 #50,56). Unternahrer does not teach the system to have a laser pumped gain medium, a seed laser signal or a periscope. Pang teaches a regenerative amplifier using ultrashort pulses wherein a low power pulsed seed beam is applied to a laser pumped gain medium ([0015], [0002]). Karasawa teaches a pulsed laser system using a Ti:Sapphire active material in which a periscope is used to redirect light paths (col.5 lines 25-26).]). It would have been obvious to one of ordinary skill in the art to combine the pulsed laser system of Unternahrer with the pulsed seed beam of Pang to use the ultrashort amplified pulses in various laser drilling and machining applications ([0016]),

as well as the laser pumped gain region to induce more efficient and concentrated gain regions inside of the active medium, and additionally to use the periscope of Karasawa to make more efficient use of the gain medium, eliminating the need for excess optical components for redirecting the power amplification pass beams.

With respect to claim 16, Unternahrer, Pang, and Karasawa teach the laser system as outlined in the rejection to claim 15, and Unternahrer further teaches retro mirrors for controlling the beam path and trajectory within the cavity (fig.1 #40,44,46).

With respect to claim 17, Unternahrer, Pang, and Karasawa teach the laser system as outlined in the rejection to claim 15, and Unternahrer further teaches a spatial filter associated with the lens system for grooming the intermediate beam while increasing its effective diameter (col.6 lines 57-62).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tod T. Van Roy whose telephone number is (571)272-8447. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Minsun Harvey can be reached on (571)272-1835. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

TVR

M... HARVEY
PRIMARY EXAMINER